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Applicant HOLMA, Harri et al	

1. The designated Office is hereby notified of its election made:

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1. The following indications appeared on record concerning:

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(71) Applicant: TELEFONAKTIEBOLAGET LM ERICSSON [SE/SE]; S–126 25 Stockholm (SE).

(72) Inventors: LUNDSJÖ, Johan; Tranebergsvägen 93, 1trp, S–167 45 Bromma (SE). JOHANSSON, Mathias; Skälbyvägen 7, S–191 49 Sollentuna (SE). DAHLMAN, Erik; Tackjärnsvägen 12, S–168 68 Bromma (SE).

(74) Agent: ERICSSON RADIO SYSTEMS AB; Common Patent Dept., S–164 80 Stockholm (SE).

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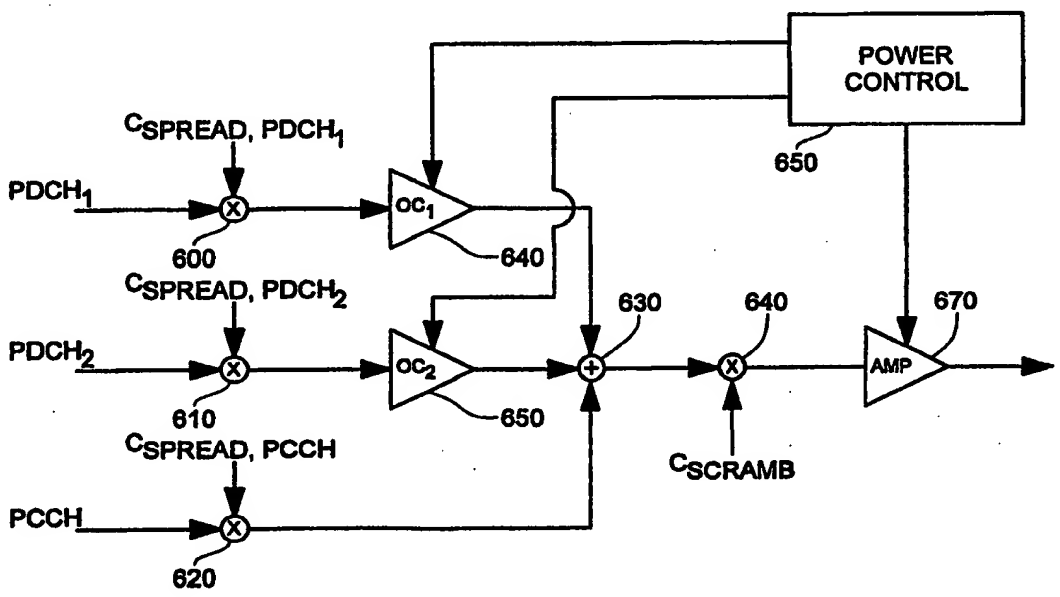

(57) Abstract

Methods of controlling the power levels of transmitted signals in telecommunication systems are described. A user may be assigned a plurality of radio bearers associated with a plurality of physical channels for communicating with a radiocommunication system. A fast power control loop monitors a reference channel and adjust transmit power in accordance with an SIR target value. A plurality of slow power control loops adjust the SIR target value and also provide offset transmit power values associated with each physical channel to adapt the transmit powers in accordance with varying quality requirements between radio bearers.

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MULTIPLE CODE CHANNEL POWER CONTROL IN A RADIO COMMUNICATION SYSTEM

BACKGROUND

This invention relates to the control of power levels of transmitted signals in telecommunication systems, in particular spread spectrum systems.

Good transmit power control methods can be important to communication systems having many simultaneous transmitters because such methods reduce the mutual interference of such transmitters. For example, transmit power control is necessary to obtain high system capacity in interference limited communication systems, e.g., those that use code division multiple access (CDMA). Depending upon the system characteristics, power control in such systems can be important for the uplink (i.e., for transmissions from a remote terminal to the network), the downlink, (i.e., for transmissions from the network to the remote terminal) or both.

In a typical CDMA system, an information data stream to be transmitted is superimposed on a much-higher-bit-rate data stream produced by a pseudorandom code generator. The information signal and the pseudorandom signal are typically combined by multiplication in a process sometimes called coding or spreading the information signal. Each information signal is allocated a unique spreading code. A plurality of coded information signals are transmitted as modulations of radio frequency carrier waves and are jointly received as a composite signal at a receiver. Each of the coded signals overlaps all of the other coded signals, as well as noise-related signals, in both frequency and time. By correlating the composite signal with one of the unique spreading codes, the corresponding information signal can be isolated and decoded.

The need for transmit power control in the uplink is recognized in current CDMA cellular systems, as may be seen from "Mobile Station-Base Station Compatibility Standard for Dual-Mode Wideband Spread Spectrum Cellular System", TIA/EIA Interim Standard TIA/EIA/IS-95 (July 1993) and its revision TIA/EIA Interim Standard TIA/EIA/IS-95-A (May 1995). Such standards that determine the features of U.S. cellular communication systems are promulgated by the

Telecommunications Industry Association and the Electronic Industries Association located in Arlington, Virginia.

Uplink power control according to the IS-95-A standard is provided by, among other techniques, a closed-loop method in which a base station measures the strength of a signal received from a remote station (e.g., relative to its associated noise) and then transmits one power control bit to the remote station every 1.25 milliseconds. Based on the power control bit, the remote station increases or decreases its transmit (uplink) power by a predetermined amount. According to Sections 6.1.2.3.2 and 7.1.3.1.7 of the standard, a "zero" power control bit causes the remote station to increase its transmit power level by 1 dB and a "one" power control bit causes the remote station to decrease its transmit power level by 1 dB. The IS-95-A standard also addresses uplink power control in other situations, such as when a remote station accesses the system (before the closed-loop power control method is active), using an open loop power control technique wherein the remote station gradually increases its transmit power level until the network responds to its access attempts.

Similar concerns exist in the downlink. To achieve reliable reception of a signal at each remote station, the ratio of the signal to the interference (SIR) should be above a prescribed threshold for each remote station (referred to as a "required signal-to-interference" level, or SIR_{req}). For example, as shown in FIG. 1, consider the case where three remote stations receive, respectively, three signals from the common CDMA communication band. Each of the signals has a corresponding energy associated therewith -- namely energy levels E1, E2 and E3, respectively. Also, present on the communication band is a certain level of noise (N). For the first remote station to properly receive its intended signal, the ratio between E1 and the aggregate levels of E2, E3 and N must be above the first remote station's required signal-to-interference ratio.

To improve the SIR for a remote station, the energy of the signal is increased to appropriate levels. However, increasing the energy associated with one remote station increases the interference associated with other nearby remote stations. As such, the radio communication system must strike a balance between the requirements of all remote stations sharing the same common channel. A steady state condition is

reached when the SIR requirements for all remote stations within a given radio communication system are satisfied. Generally speaking, the balanced steady state may be achieved by transmitting to each remote station using power levels which are neither too high nor too low. Transmitting messages at unnecessarily high levels raises interference experienced at each remote receiver, and limits the number of signals which may be successfully communicated on the common channel (e.g. reduces system capacity).

This technique for controlling transmit power in radiocommunication systems is commonly referred to as a fast power control loop. The initial SIR target is established based upon a desired quality of service (QoS) for a particular connection or service type. For non-orthogonal channels, the actual SIR values experienced by a particular remote station or base station can be expressed as:

$$SIR = \frac{\textit{Mean power of received signal}}{\textit{Sum of the mean powers of all interfering signals}} \qquad (1)$$

The SIR is measured by the receiving party and is used for determining which power control command is sent to the transmitting party.

A slow power control loop can then be used to adjust the SIR target value on an ongoing basis. For example, the remote station can measure the quality of the signals received from the remote station using, for example, known bit error rate (BER) or frame error rate (FER) techniques. Based upon the received signal quality, which may fluctuate during the course of a connection between the base station and a remote station, the slow power control loop can adjust the SIR target that the fast power control loop uses to adjust the base station's transmitted power. Similar techniques can be used to control uplink transmit power.

As radiocommunication becomes more widely accepted, it will be desirable to provide various types of radiocommunication services to meet consumer demand. For example, support for facsimile, e-mail, video, internet access, etc. via radiocommunication systems is envisioned. Moreover, it is expected that users may

wish to access different types of services at the same time. For example, a video conference between two users would involve both speech and video support. One technique for handling the different types of data communication involved in these situations is to provide a different radio bearer for each service. A radio bearer provides the capability for information transfer over the radio interface and is characterized by attributes such as information transfer rate (i.e., bit rate or throughput) and delay requirements, etc. A radio bearer carries either user data or control signalling. Typically a bearer is used for a specific service, e.g., speech. A radio bearer may span several physical channels or multiple radio bearers may share a physical channel depending on the bandwidth requirements of each radio bearer. In addition to one or more physical data channels (PDCHs), the user will be allocated a physical control channel (PCCH) on which overhead control information is carried to the user, e.g., bit rate information of the associated PDCHs, transmit power control bits and pilot symbols, at a constant bit rate, which can be used to make the SIR measurements used in the fast power control loop process. One potential relationship between radio bearers and physical channels is illustrated in Figure 1B. Therein two radio bearers (RB1 and RB2) provide data blocks to multiplexor 2. The selected blocks are provided with forward error correction (FEC) coding 4 and are then interleaved 6 prior to being spread using the spreading code associated with PDCH1 at 8. Similar branches, not completely shown, can be provided for PDCH2 and the PCCH. Each of the resulting physical channels is then summed at block 11 and scrambled at block 10 prior to transmission.

However, the various services, and therefore radio bearers, may have different QoS requirements. Thus, it would be desirable to provide a slow power control loop for each radio bearer (or at least each PDCH) to enable these different QoS requirements to be accounted for during the power control process.

SUMMARY

These and other problems of previous communication systems are solved by Applicants' invention, wherein the transmit powers of the PCCH and PDCHs that are

assigned to a specific user are controlled by the same fast control loop, such that the transmit powers on these physical channels are raised or lowered simultaneously in the same direction. On top of the fast control loop, the relative transmit powers of the PCCH and each PDCH are adjusted by a combination of slow power control loops associated with the quality requirements and measured receive quality of the respective radio bearers. The transmit power of the PCCH serves as a reference, while the transmit powers of the PDCHs are defined as offsets (in dB) to the PCCH transmit power. These offsets, as well as the PCCH SIR target, are adjusted by a combination of the different slow control loops.

According to exemplary embodiments of the present invention, a mobile station receives signals over an air interface from the radiocommunication system, i.e., from a base station. These signals include fast power control loop transmit power commands and power offset commands associated with slow power control loop evaluation of the received signal quality at the base station. The mobile station uses these commands to adjust its transmit power on each of its allocated physical channels. The physical data channels are individually adjusted using the offset power commands, while all of the channels are adjusted using the transmit power command of the fast power control loop. At the same time, the mobile station evaluates the signal-to-interference ratio and quality of its received signals to provide analogous transmit power commands and power offset commands to the base station on the uplink. The base station receives these transmit power commands and power offset commands and adjusts its transmit power accordingly.

Various exemplary embodiments are described for implementing slow power control loops according to the present invention. For example, radio bearers which are mapped onto the same physical channel have their measured qualities compared with their quality requirements. If these comparisons indicate that one of the radio bearers needs improved quality, then the result is an output signal indicating that more power is needed for that particular physical channel.

The PCCH can have its SIR target updated in one of several ways. For example, quality of the PCCH can be measured and compared against a required quality. Alternatively, the SIR target can be varied in accordance with the most

stringent requirements of the various radio bearers on the physical data channels. That is, if any of the radio bearers need increased quality, then the SIR target can be increased as well.

According to another exemplary embodiment, instead of using a single required quality for comparison with the measured quality of a radio bearer, two thresholds can be used to provide a quality window within which that radio bearer would not request additional transmit power. In this way, if none of the radio bearers associated with a particular physical channel require additional transmit power, then it is not necessary to transmit a power offset command associated with that particular physical channel to the transmitting unit at that measurement interval. In this way, overhead signalling can be reduced to thereby increase data throughput in the system.

BRIEF DESCRIPTION OF THE DRAWINGS

The features and objects of Applicants' invention will be understood by reading this description in conjunction with the drawings, in which:

FIG. 1A is a graph of power versus frequency for an exemplary spread spectrum system;

FIG. 1B illustrates the packaging of radio bearers into physical channels;

FIG. 2 illustrates a base station and mobile station communicating in a radiocommunication system;

FIG. 3 illustrates an exemplary base station according to an exemplary embodiment of the present invention;

FIG. 4 illustrates an exemplary mobile station according to an exemplary embodiment of the present invention;

FIG. 5 illustrates the interaction between slow power control loops according to the present invention;

FIG. 6 illustrates an exemplary implementation for adjusting transmit power in accordance with the present invention; and

FIG. 7 graphically depicts power control on three physical channels according to the present invention.

DETAILED DESCRIPTION

While this description is in the context of cellular communications systems involving portable or mobile radio telephones, it will be understood by those skilled in the art that Applicants' invention may be applied to other communications applications. Moreover, while the invention may be used in CDMA communication systems, it also may be used in other types of communication systems.

Consider the exemplary cell **50** depicted in FIG. 2. Therein, a base station **100** is currently handling a connection with a mobile station MS **110**. Of course, those skilled in the art will appreciate that base station **100** would typically support connections with many mobile stations concurrently, however interaction between a single mobile station and the network is sufficient to illustrate power control techniques according to the present invention. For the purposes of this exemplary embodiment, consider that the system depicted in FIG. 2 operates using a CDMA technology with duplexed downlink (i.e. base-to- mobile direction) and uplink (i.e. mobile-to-base direction) channels. In this example, MS **110** has been allocated three uplink and three downlink physical channels (PCCH, PDCH1 and PDCH2) as indicated by the three bidirectional arrows. Of course, those skilled in the art will appreciate that the physical channels are unidirectional in nature and that a mobile station may have a different number of physical channels allocated to it in the downlink than in the uplink, e.g., for an internet connection wherein more downlink than uplink bandwidth is required.

In the context of this exemplary CDMA system, a physical channel is identified by its code (i.e., short, long or combination thereof), frequency and bandwidth. In the downlink, base station **100** transmits to mobile station MS **110** using a certain power level associated with each of the physical channels. In the uplink, mobile station MS **110** communicates with base station **100** using a certain power level associated with each physical channel. Although not shown, the base station **100** is in communication with a radio network controller (RNC) via a mobile switching center (MSC), which in turn is connected to a public switched telephone network (PSTN).

As illustrated in FIG. 3, base station **100** includes a receive antenna for receiving signals from, e.g., MS **110**. The received signals can, for example, be amplified at block **11** and processed by each of a plurality of receive signal processing blocks **12, 12b, 12c . . .**, only three of which are illustrated for simplicity of the figure. The particular details associated with decoding/demodulating CDMA signals are known to those skilled in the art and, accordingly, will not be further described herein. However, each of the receivers **12a, 12b** and **12c** could, for example, include correlators associated with the code words corresponding to PCCH, PDCH1 and PDCH2, such that the data transmitted by MS **110** over these physical channels was extracted and provided to regional processor **9** over lines DATA OUT 1, DATA OUT 2 and DATA OUT 3, respectively. In addition to processing the extracted data for other purposes, regional processor **9** receives the transmit power control commands and power offset commands transmitted by MS **110** as a result of the mobile unit's fast and slow power control loops, respectively. The operation of these power control loops according to the present invention is described below with respect to FIG. 5. Thus information is passed from regional processor **9** to power control unit **14**, which uses the power control commands and power offset commands to adjust the transmit power of transmitters **16a, 16b** and **16c** and amplifier **17** as described below.

Regional processor **9** also analyzes the received signals to determine the SIR experienced by base station **100** (e.g., as described in Equation (1)) and to determine a quality measure for the received uplink signals (e.g., BER and/or (FER)). This information is used by the processor **9** to determine appropriate power control and power offset commands which are transmitted to MS **110** over the PCCH.

According to FIG. 4, an exemplary mobile station **110** is equipped with a receiver **22** which operates in a conventional manner to filter, amplify and demodulate a signal from antenna **20**. Similar power control functionality is provided to MS **110** as to base station **100** described above. A first decoder **24** is provided for selectively receiving and decoding its intended signal transmitted from the base station **100**, (e.g., that transmitted in the PCCH). Data signals demodulated in the first decoder are generated as output data signals for subsequent use. Likewise signals on other

channels assigned to MS 110, e.g., PDCH1 and PDCH2, can be decoded at blocks 26 and 27, respectively. The output data is used by processor 25 in a known manner to reconstruct and output the conveyed information, e.g., to provide the audio and video output of a wirelessly transmitted video conference. At the same time, information obtained during the decoding process can be used to determine the SIR experienced by MS 110 and to perform other quality measurements, e.g., BER and FER calculations. For example, the SIR and quality measurement block 28 can calculate MS 110's SIR as described above in equation (1). The BER and/or FER measurements can be performed using any known technique. The calculated SIR and quality information is supplied to processor 25 by the SIR and quality measurement unit 28. Processor 28 uses the quality measurements to adjust the SIR target value and the power offset values in its slow power control loop as described below. Processor 25 also uses this information to determine which power control command (i.e., "up" or "down") and power offset commands (described below) to include in the messages to be sent on the uplink for use by the base station in its power control unit 14.

Processor 25 also receives the uplink power control commands transmitted by base station 100 and passes those commands to power level controller 29. Modulator 34 receives the uplink information to be transmitted on the PCCH, PDCH1 and PDCH2, modulates the information using any known modulation technique (e.g., QPSK) and passes the modulated data to transmitter 32. The power level at which the different physical channels are transmitted is controlled by power level controller 29 and may vary between channels depending upon the power offset values received from base station 100.

Having described an exemplary base station and mobile station for communicating information over a plurality of physical channels onto which one or more radio bearers can be mapped, and making various signal strength and quality measurements, exemplary techniques for controlling SIR power targets and generating the power control and power offset commands according to the present invention will now be described with respect to FIG. 5. The following applies to both uplink or downlink power control. Therein, the quality (Q_N) measured for each radio bearer (RB) that is assigned to MS 110 is applied to an input of one of the comparators 150,

160, 180 and 190. As mentioned earlier, quality can be measured as a function of BER, FER, a combination of BER and FER or any other quality parameter. The measured quality is compared with the QoS requirement (Q_{req}) assigned to that radio bearer. If the measured quality is less than the required quality, then the comparator outputs a transmit power "up" command, e.g., a binary 1. If, on the other hand, the measured quality is greater than the required quality, then the comparator outputs a transmit power "down" command, e.g., a binary zero. As can be seen in FIG. 5, radio bearers which are mapped onto a single physical channel are grouped together for the purposes of determining power control. In the example of FIG. 5, RB1 and RB2 are mapped onto PDCH1, while RB3 and RB4 are mapped onto PDCH2. For those radio bearers which are mapped onto the same physical channel, their respective transmit powers cannot easily be changed, e.g., without changing the channel coding.

Thus, for those radio bearers which are mapped onto a common channel, the most stringent power requirement at any given measurement interval is adopted for adjusting the associated power offset of SIR target value. For example, with respect to the branches associated with RB1 and RB2, if at least one of the slow power control loops associated with comparators 150 and 160 indicate that a power up action should be taken on PDCH1, then OR gate 190 will output a binary 1. Similarly, for RB3 and RB4, if either comparators 180 or 190 indicate that additional transmit power is necessary to meet the quality requirements of one of these radio bearers, then OR gate 210 will output a binary 1 indicating that the transmit power should be increased.

According to exemplary embodiments of the present invention, the SIR target can be adjusted in two different ways. First, the quality on the PCCH can be measured and compared with the required quality in comparator 170 in a manner similar to that provided for the PDCHs. Alternatively, the SIR target can be adapted in accordance with the most stringent requirement among the different radio bearers using logical OR gate 220. Switch 230 is provided in FIG. 5 to illustrate the alternative possibilities for adapting the SIR target. The selection of one of these two

techniques will depend upon various system design criteria, e.g., the feasibility of performing quality measurements on the control channel.

Although changing the relative transmit powers of radio bearers mapped onto the same physical channel is difficult, the relative transmit powers of radio bearers that are mapped onto different PCDHs, e.g., RB1 and RB3, as well as the relationship between the transmit powers of the PCCH and these PDCHs, can readily be adjusted using the technique illustrated in FIG. 5 by the respective PDCH power offsets. This is accomplished by adjusting the power at which a PDCH is transmitted relative to its associated PCCH using the quality comparisons described above. These offsets will vary over time. For example, the change in transmit power offset for PDCH1 is equal to the difference between the output of OR gate **200** and the change in the SIR target carried on switch **230** as computed at difference block **240**. Similarly, the change in the power transmit offset for PDCH2 is computed at block **250** as the difference between the output of OR gate **210** and the signal carried via switch **230**. The particular power steps x and y associated with the PDCHs and PCCH, respectively can either be a fixed number of dBs or can be adaptive in some way, e.g., depending upon how much the measured quality differs from the QoS requirement.

All the logic illustrated in FIG. 5 can be located in the receiving unit. However, the changes in transmit power offsets for the PDCHs, i.e., the offsets output by difference blocks **240** and **250**, are transmitted to the transmitting unit via the aforedescribed power offset commands. Thus, techniques according to the present invention provide two different slow power control loop for adjusting the SIR target associated with a base or mobile station and a plurality of slow power control loops each associated with a different physical data channel.

The power offsets determined for each physical data channel can be used to transmit information on those channels at different power levels. An exemplary technique for implementing these power offsets is illustrated in FIG. 6. Therein, each of PDCH1, PDCH2 and PCCH are spread by their unique spreading codes at blocks **600**, **610** and **620**, respectively. Prior to being summed with the other physical channels (block **630**) and scrambled (block **640**), PDCH1 is adjusted (amplified) by

variable gain amplifier **640**. The gain α_1 of amplifier **640** is controlled by power control unit **650** (e.g., power control unit **14** of base station **100** or power level controller **29** of MS **110**) in accordance with the power offset commands. The transmit power of PDCH2 is offset from that of the PCCH in a similar manner using amplifier **650**. Fast power control (i.e., up and down commands) is implemented at amplifier **670** in accordance with the power control commands.

FIG. 7 provides a graphical representation of power control on the three associated physical channels described above. In the figure, the fast loop power control provides the same periodic step increases and decreases in transmit power for each of the three physical control channels until a slow power control loop update occurs (shown in FIG. 7 as SIR_{th} update). In the example shown in FIG. 7, this particular slow loop update results in a negative change in the transmit power associated with PDCH1 relative to the PCCH and an increase in the transmit power for PDCH2 relative to the PCCH.

As can be seen from the foregoing, techniques according to the present invention, make it possible to employ individual slow power control on different radio bearers that are assigned to one user, while only having a single fast power control loop per user and transmit direction (up- and downlink). By letting all the PDCHs share the same associated PCCH and employing a common fast power control loop, signaling overhead associated with the transmit power control commands is minimized.

In cellular systems in general, and cellular CDMA systems in particular, it is important that the transmit power for each user is not larger than necessary, in order to minimize the interference to the other users. Different types of services, e.g. speech, video and email, have large differences in QoS requirements and coding schemes. Therefore it is desired that different radio bearers assigned to one user can be power controlled individually. Otherwise, the transmit power would have to be adjusted according to the most stringent quality requirement among the different bearers, resulting in unnecessary high transmit powers for the other bearers. By mapping bearers with differing QoS requirements onto different PDCHs, and letting corresponding slow power control loops adjust the SIR target for the fast power

control loop and the relative transmit powers of all PDCHs and the PCCH as proposed herein, the total transmit power and the interference to other users can be lowered. Lower interference spread into the system implicitly raises the system capacity.

The exemplary embodiment of FIG. 5 describes measured quality comparisons with a single threshold (Q_0S) to determine whether up or down power control commands are needed for a particular radio bearer or the PCCH. However, according to another exemplary embodiment of the present invention, two thresholds can be used to reduce the signalling associated with transmitting the power offset commands over the air interface. For example, a first and second threshold can be used to create a "window" around the required quality for RB1 in FIG. 5 as:

$$\text{Thresh}_1 < Q_{REQ1} < \text{Thresh}_2$$

If the measured quality is inside the window established by the two thresholds, then no power adjustment is needed for this particular radio bearer. If the measured quality exceeds Thresh_2, then a power down command would generated, and if the measured quality falls below Thresh_1, then a power up command would be generated. Thus, the logic of FIG. 5 for this embodiment would include three states, i.e., up, down and no change. Again, the most stringent radio bearer requirement would govern the change in the power offset. However, for cases where the measured quality for each radio bearer mapped onto a physical channel are within their respective quality windows, and if the transmit power for the PCCH also need not be changed, then the offset can remain the same and no power offset command need be transmitted from the receiving unit to the transmitting unit.

Moreover, although exemplary embodiments of the present invention describe a situation wherein a user is allocated a PCCH, which can be used as a reference channel with respect to which power offset commands can be generated for associated PDCHs, those skilled in the art will appreciate that some systems may not utilize PCCHs in this manner. If a PCCH is not allocated to a user, then any other channel, e.g., one of the PDCHs, can be used as the reference channel.

It will be understood that Applicants' invention is not limited to the particular embodiments described above and that modifications may be made by persons skilled in the art. The scope of Applicants' invention is determined by the following claims, and any and all modifications that fall within that scope are intended to be included therein.

We Claim:

1. A method for controlling transmit power in a radiocommunication system comprising the steps of:

assigning a plurality of physical channels to a user in said radiocommunication system;

measuring a characteristic of one of said plurality of physical channels which serves as a reference channel;

controlling transmit power associated with said reference channel based on said measured characteristic; and

adjusting transmit power of each of the plurality of physical channels other than said reference channel relative to the reference channel transmit power using individual power control loops.

2. The method of claim 1 wherein said reference channel is a physical control channel (PCCH) carrying control information.

3. The method of claims 1 wherein said step of measuring further comprises the step of:

measuring a signal-to-interference ratio (SIR) of said reference channel.

4. The method of claim 3 wherein said step of controlling transmit power further comprises the step of:

controlling the transmit power associated with said reference channel based on a comparison of the measured SIR and a target SIR value.

5. The method of claim 4, further comprising the step of:

adjusting said target SIR value according to quality measurements on the reference channel, where the target SIR value is decreased when the measured quality goes above a first threshold, and the target SIR value is increased when the measured quality falls below a second threshold.

6. The method of claim 5, wherein said target SIR value remains unchanged if said quality measurements are between said first and said second thresholds.

7. The method of claim 4 further comprising the steps of:

adjusting said target SIR value according to quality measurements on radio bearers that are assigned to the user, where the target SIR value is increased if the measured quality on at least one of the radio bearers falls below a first threshold associated with said at least one of the radio bearers, and the target SIR value is decreased if the measured quality on all radio bearers goes beyond a second threshold specific for each particular radio bearer.

8. The method of claim 1 wherein said step of adjusting transmit power of each of said plurality of physical channels other than said reference channel further comprises the steps of:

measuring a quality associated with each radio bearer mapped onto one or more of said plurality of physical channels; and

adjusting a transmit power of each of said plurality of physical channels other than said reference channel relative to the transmit power of said reference channel based on said measured quality.

9. The method of claim 5, wherein said step of adjusting transmit power of each of said plurality of physical channels other than said reference channel further comprises the steps of:

measuring a quality associated with each radio bearer mapped onto one or more of said plurality of physical channels; and

adjusting, at each update of said target SIR value, a transmit power of each of said plurality of physical channels other than said reference channel relative to the transmit power of said reference channel based on said measured quality by

determining a change in difference between a transmit power of each physical channel other than said reference channel and a transmit power of said reference channel.

10. The method of claim 9, wherein said step of determining a change in difference further comprises the step of:

setting said difference equal to a difference between x dB and y dB, where:

x is positive if a measured quality on at least one radio bearer mapped onto a particular physical channel falls below a first threshold associated with said particular radio bearer;

x is negative if measured quality on all of the radio bearers that are mapped onto said particular physical channel goes beyond a respective second threshold associated with each particular radio bearer; and

y is the dB change in said target SIR value.

11. The method of claim 6, wherein said step of adjusting transmit power of each of said plurality of physical channels other than said reference channel further comprises the steps of:

measuring a quality associated with each radio bearer mapped onto one or more of said plurality of physical channels; and

adjusting, at each update of said target SIR value, a transmit power of each of said plurality of physical channels other than said reference channel relative to the transmit power of said reference channel based on said measured quality by determining a change in difference between a transmit power of each physical channel other than said reference channel and a transmit power of said reference channel.

12. The method of claim 11, wherein said step of determining a change in difference further comprises the step of:

setting said difference equal to a difference between x dB and y dB, where:

x is positive if a measured quality on at least one radio bearer mapped onto a particular physical channel falls below a first threshold associated with said particular radio bearer;

x is negative if measured quality on all of the radio bearers that are mapped onto said particular physical channel goes beyond a respective second threshold associated with each particular radio bearer; and

y is the dB change in said target SIR value.

13. A communication station comprising:

a receiving unit for receiving a transmit power control command and at least one power offset command;

a transmitter for transmitting data on a physical control channel and at least one physical data channel; and

a power control unit for adjusting a transmit power common to both said physical control channel and said at least one physical data channel using said power control command and for adjusting a relative transmit power between said physical control channel and said at least one physical data channel using said at least one power offset command.

14. The communication station of claim 13, wherein said communication station is a base station.

15. The communication station of claim 13, wherein said communication station is a mobile station.

16. The communication station of claim 13, wherein said transmitter further comprises:

a first spreading unit for spreading data associated with said physical control channel;

a second spreading unit for spreading data associated with said at least one physical data channel;

a variable gain amplifier connected to said second spreading unit for adjusting said relative transmit power; and

a summing device for combining an output of said first spreading unit and an output of said variable gain amplifier.

17. The communication station of claim 16, further comprising:

a scrambling unit for scrambling said combined outputs;

a second variable gain amplifier for adjusting said transmit power common to said physical control channel and said at least one physical data channel.

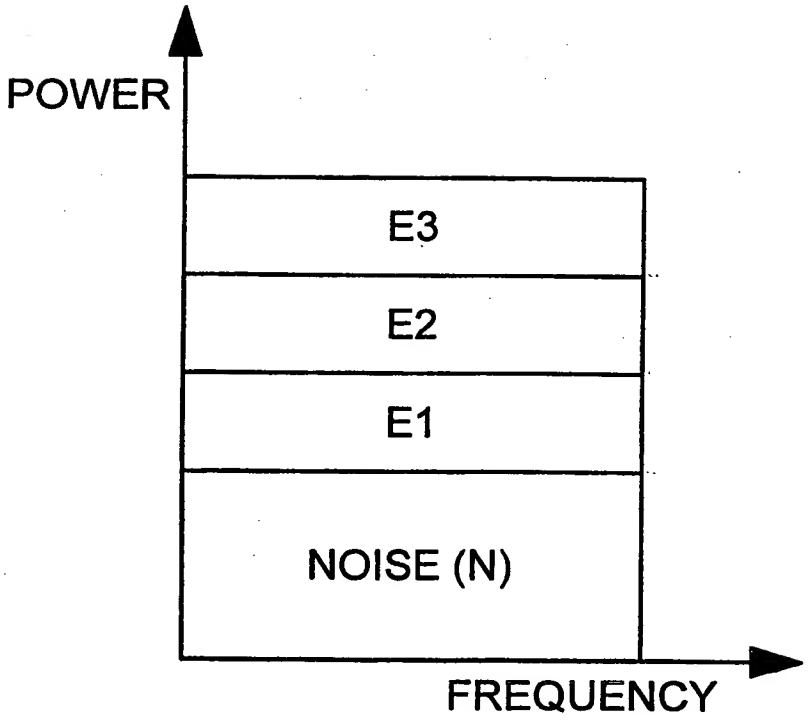

FIG. 1A

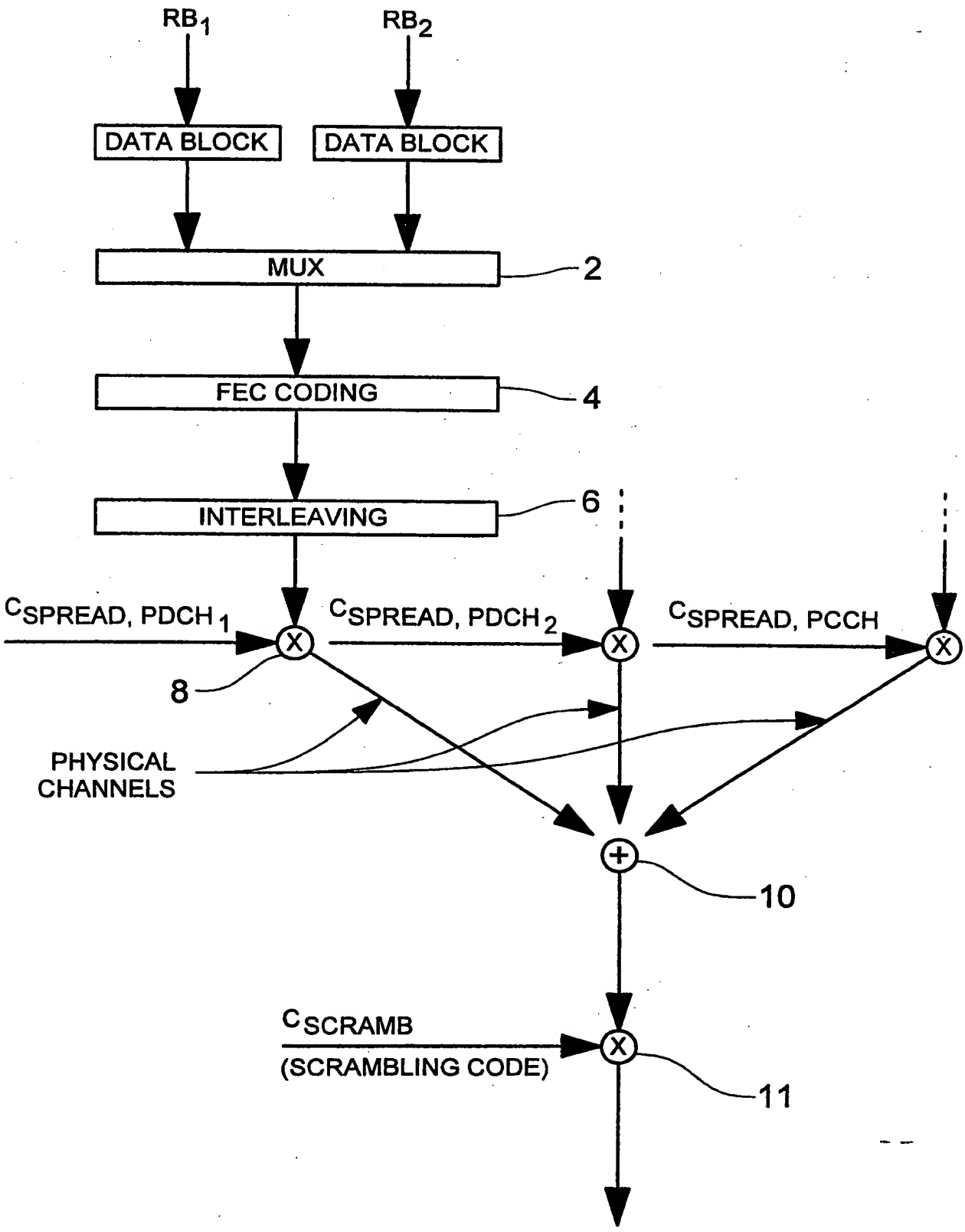
RB1
RB2
DATA BLOCK
DATA BLOCK
MUX
2
FEC CODING
4
INTERLEAVING
6
CSPREAD, PDCH 1
CSPREAD, PDCH 2
CSPREAD, PCCH
8
PHYSICAL CHANNELS
10
CSCRAMB
(SCRAMBLING CODE)
11

FIG. 1B

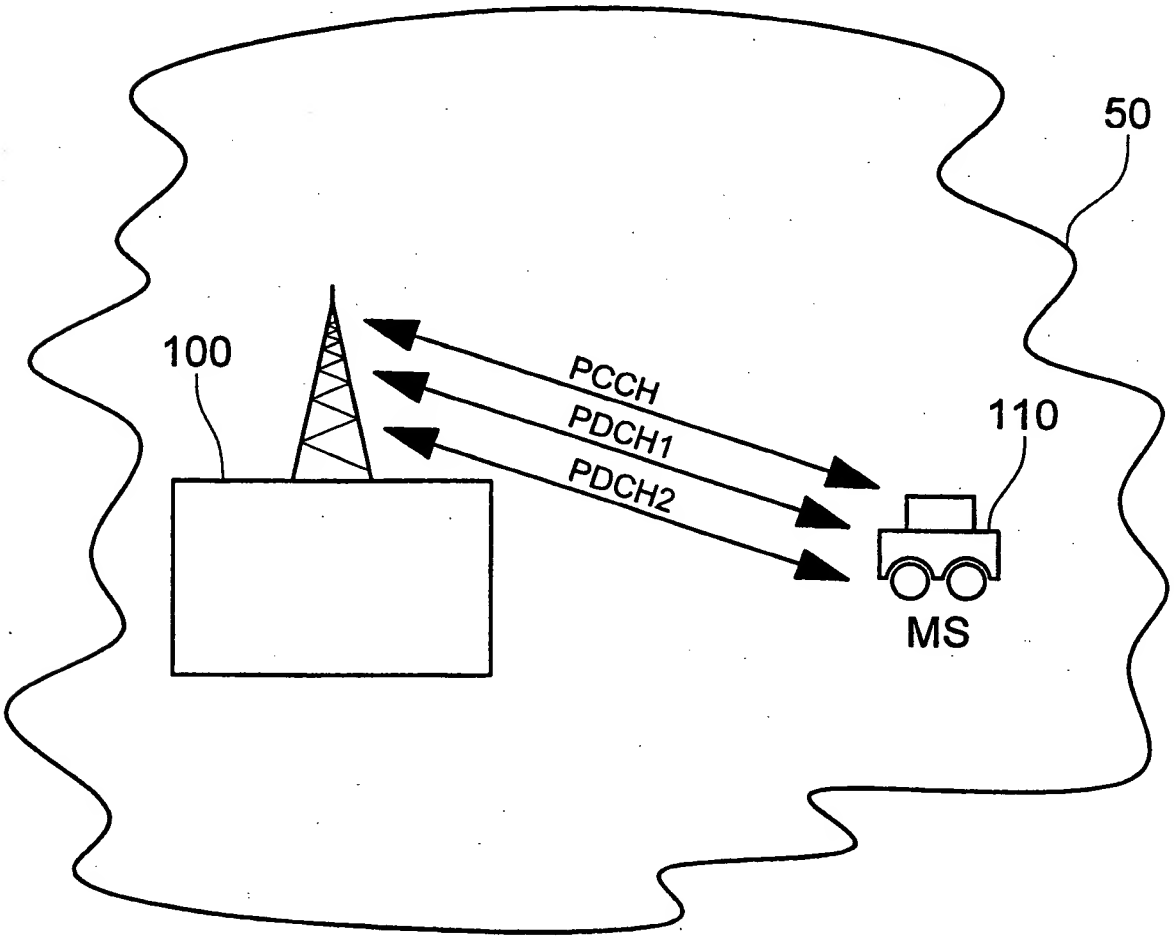

FIG. 2

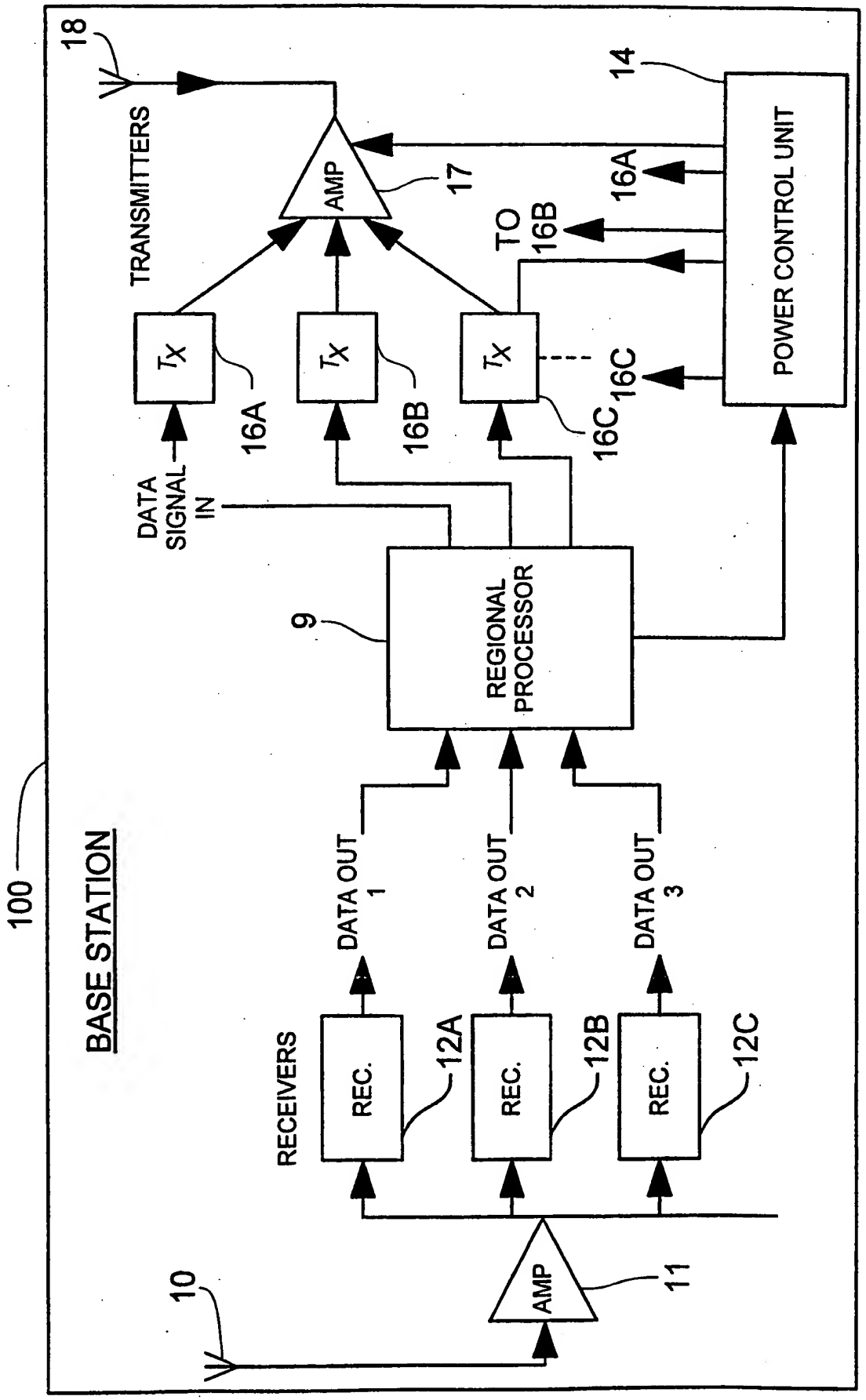
BASE STATION
100
18
TRANSMITTERS
AMP
17
14
POWER CONTROL UNIT
16A
TO
16B
16C
Tx
Tx
Tx
16A
16B
16C
DATA
SIGNAL
IN
9
REGIONAL
PROCESSOR
DATA OUT
1
DATA OUT
2
DATA OUT
3
RECEIVERS
REC.
REC.
REC.
12A
12B
12C
10
AMP
11

FIG. 3

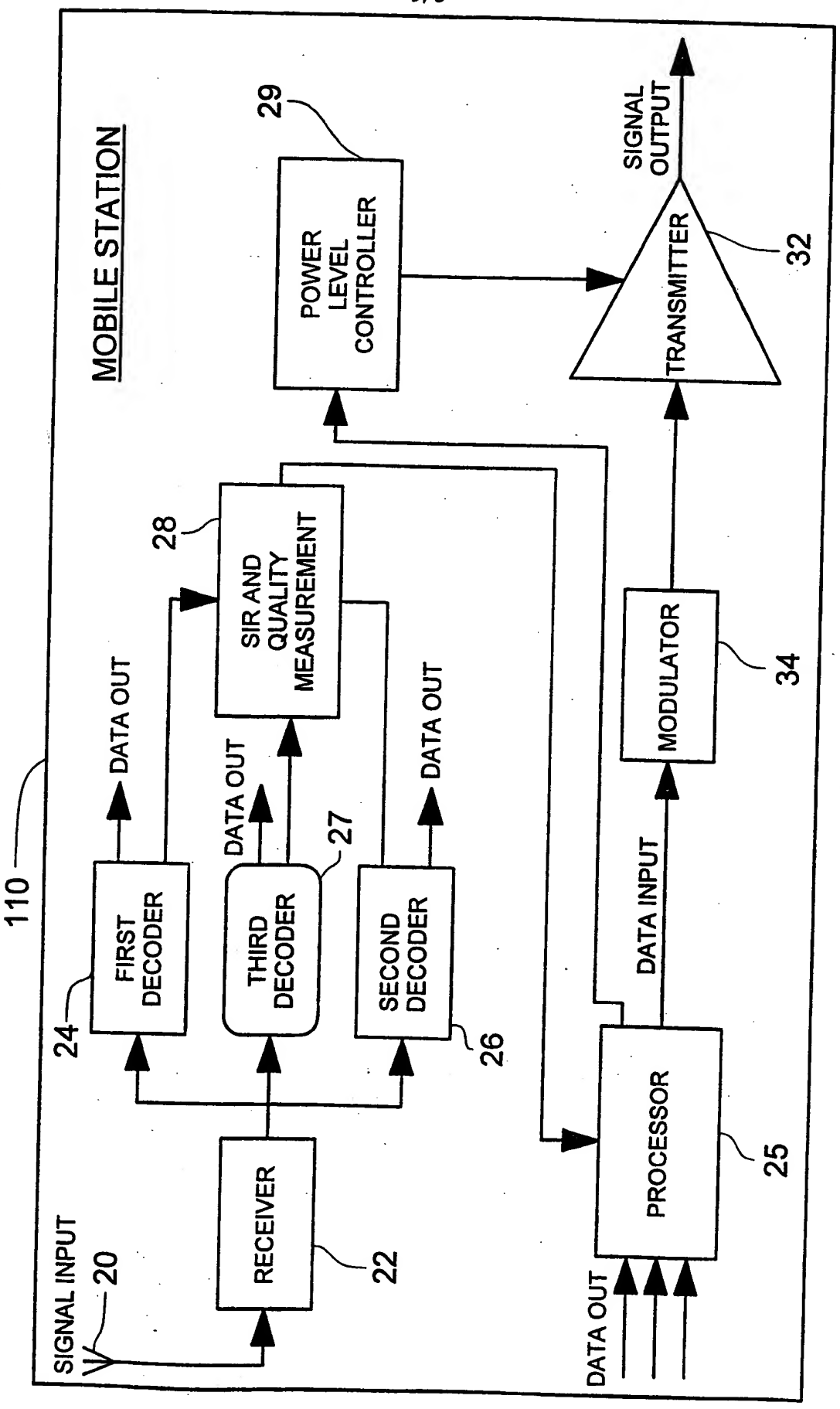
MOBILE STATION
110
SIGNAL INPUT
20
RECEIVER
22
FIRST DECODER
24
THIRD DECODER
27
SECOND DECODER
26
DATA OUT
DATA OUT
DATA OUT
SIR AND QUALITY MEASUREMENT
28
POWER LEVEL CONTROLLER
29
PROCESSOR
25
DATA INPUT
MODULATOR
34
TRANSMITTER
32
SIGNAL OUTPUT
DATA OUT

FIG. 4

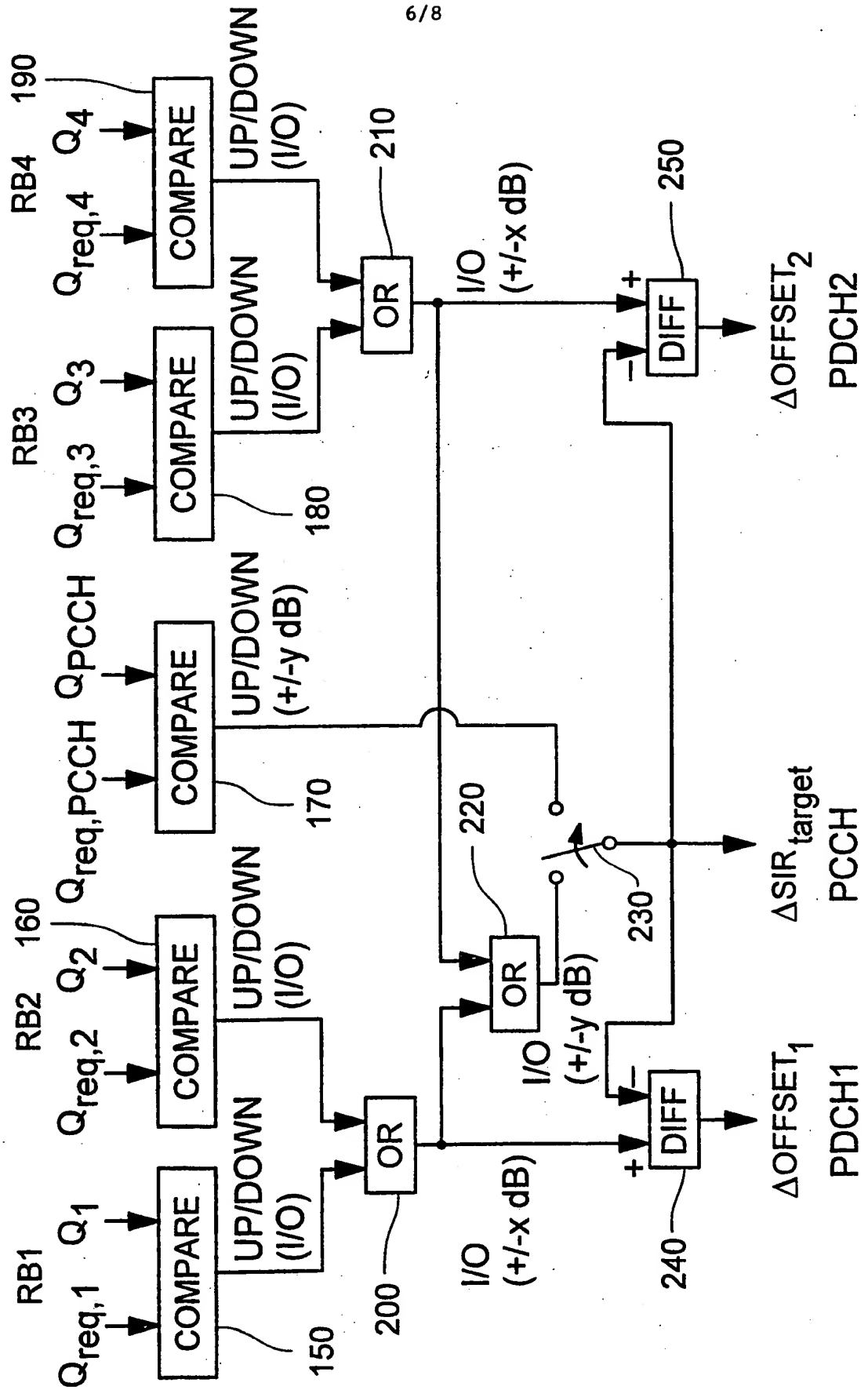
RB1
RB2
RB3
RB4
$Q_{req,1}$
$Q_{req,2}$
$Q_{req,3}$
$Q_{req,4}$
$Q_{req,PCCH}$
Q_1
Q_2
Q_3
Q_4
Q_{PCCH}
COMPARE
UP/DOWN (I/O)
UP/DOWN (+/-y dB)
150
160
170
180
190
200
210
220
230
240
250
OR
I/O (+/-x dB)
I/O (+/-y dB)
DIFF
$\Delta OFFSET_1$
PDCH1
$\Delta OFFSET_2$
PDCH2
ΔSIR_{target}
PCCH

FIG. 5

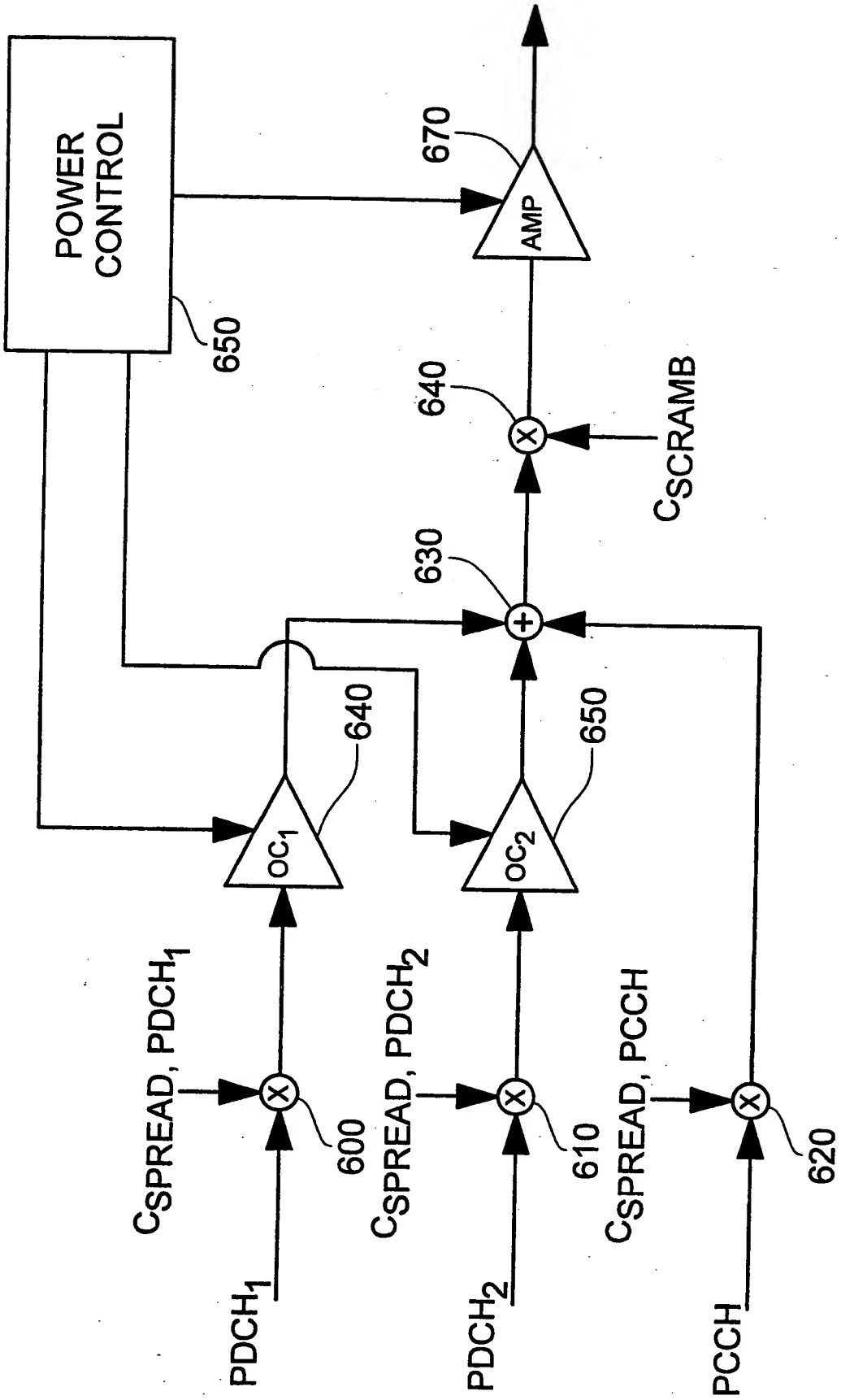
POWER CONTROL
650
670
AMP
640
C_{SCRAMB}
630
640
650
OC_1
OC_2
C_{SPREAD}, $PDCH_1$
C_{SPREAD}, $PDCH_2$
C_{SPREAD}, PCCH
600
610
620
$PDCH_1$
$PDCH_2$
PCCH

FIG. 6

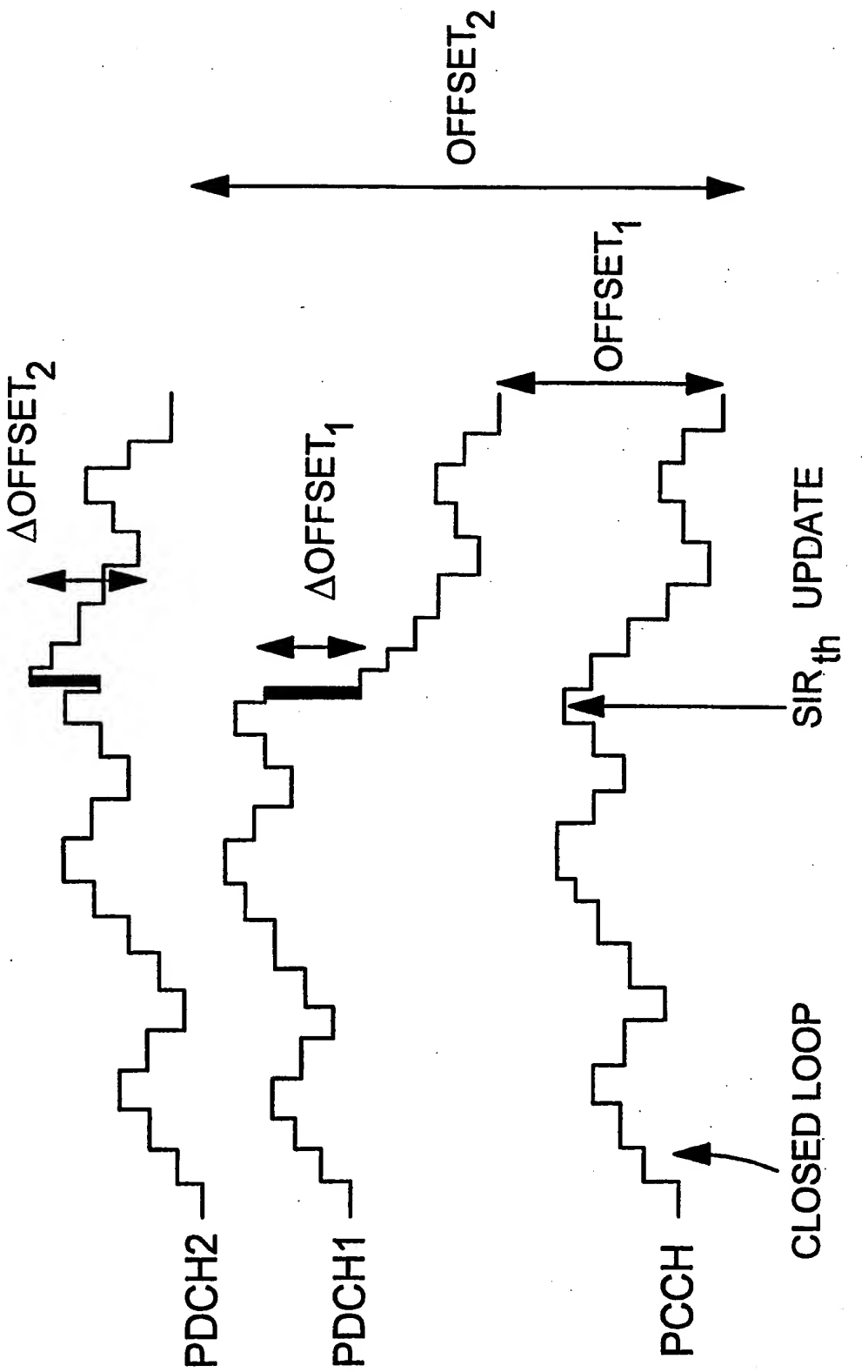
OFFSET2
OFFSET1
ΔOFFSET2
ΔOFFSET1
SIRth UPDATE
CLOSED LOOP
PDCH2
PDCH1
PCCH

FIG. 7

INTERNATIONAL SEARCH REPORT

In ational Application No
PCT/SE 98/01139

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 H04B7/005

According to International Patent Classification(IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 6 H04B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5 604 730 A (TIEDEMANN JR EDWARD G) 18 February 1997 * abstract * see column 2, line 46 - column 3, line 20 see column 4, line 8 - line 24 see column 4, line 52 - line 61 see claims 1-4; figures 1,3B,4	1,13
A	EP 0 682 419 A (NIPPON TELEGRAPH & TELEPHONE) 15 November 1995 * abstract * see column 4, line 49 - column 6, line 23 see claims 1-3; figure 4	1,13

-/--

[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

° Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
26 October 1998	05/11/1998

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Lopez Marquez, T

1

Form PCT/ISA/210 (second sheet) (July 1992)

INTERNATIONAL SEARCH REPORT

Int. tional Application No
PCT/SE 98/01139

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document. with indication.where appropnate. of the relevant passages	Relevant to claim No.
A	EP 0 548 939 A (NIPPON ELECTRIC CO) 30 June 1993 * abstract * see column 2, line 12 - line 42 see column 3, line 54 - column 4, line 10 see claim 1; figures 1,4,8,9	1,13

Form PCT/ISA/210 (continuation of second sheet) (July 1992)

INTERNATIONAL SEARCH REPORT

Information on patent family members

Int. ional Application No
PCT/SE 98/01139

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 5604730 A	18-02-1997	AU 3003195 A	22-02-1996
		BR 9508428 A	23-12-1997
		CA 2195984 A	08-02-1996
		EP 0774179 A	21-05-1997
		FI 970319 A	13-03-1997
		JP 10503337 T	24-03-1998
		WO 9603813 A	08-02-1996
		ZA 9505843 A	15-03-1996
EP 0682419 A	15-11-1995	JP 8032514 A	02-02-1996
		CA 2149096 A	13-11-1995
		CN 1126929 A	17-07-1996
		US 5590409 A	31-12-1996
EP 0548939 A	30-06-1993	JP 5244056 A	21-09-1993
		US 5386589 A	31-01-1995

PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference	FOR FURTHER ACTION	See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)
50192/sku/pkk		
International application No.	International filing date *(day/month/year)*	Priority date *(day/month/year)*
PCT/FI00/00561	22/06/2000	24/06/1999
International Patent Classification (IPC) or national classification and IPC H04B7/005		
Applicant NOKIA NETWORKS OY		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 5 sheets, including this cover sheet.

   ☒ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

   These annexes consist of a total of 5 sheets.

3. This report contains indications relating to the following items:

   - I ☒ Basis of the report
   - II ☐ Priority
   - III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
   - IV ☐ Lack of unity of invention
   - V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations suporting such statement
   - VI ☐ Certain documents cited
   - VII ☒ Certain defects in the international application
   - VIII ☐ Certain observations on the international application

Date of submission of the demand	Date of completion of this report
18/01/2001	13.09.2001
Name and mailing address of the international preliminary examining authority: European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized officer Burghardt, G Telephone No. +49 89 2399 8979

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INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/FI00/00561

I. Basis of the report

1. With regard to the **elements** of the international application *(Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17))*:
Description, pages:

1-5,7-17	as originally filed			
6,6a	as received on	11/05/2001	with letter of	09/05/2001

Claims, No.:

1-21	as received on	11/05/2001	with letter of	09/05/2001

Drawings, sheets:

1/4-4/4	as originally filed

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

   These elements were available or furnished to this Authority in the following language: , which is:

   - ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
   - ☐ the language of publication of the international application (under Rule 48.3(b)).
   - ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

   - ☐ contained in the international application in written form.
   - ☐ filed together with the international application in computer readable form.
   - ☐ furnished subsequently to this Authority in written form.
   - ☐ furnished subsequently to this Authority in computer readable form.
   - ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
   - ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
- ☐ the claims, Nos.:
- ☐ the drawings, sheets:

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

   (Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)

6. Additional observations, if necessary:

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims 1-21
	No:	Claims
Inventive step (IS)	Yes:	Claims 1-21
	No:	Claims
Industrial applicability (IA)	Yes:	Claims 1-21
	No:	Claims

2. Citations and explanations
   see separate sheet

VII. Certain defects in the international application

The following defects in the form or contents of the international application have been noted:
see separate sheet

Re Item I

Basis of the report

Claim 1, 12 and 18 are based on original claims 1, 12 and 18, respectively, and page 5, lines 30 to 34 and page 6, line 34 to page 7, line 7.

Re Item V

Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Reference is made to the following document:

   D1: EP 0 853 393 A1 (NTT MOBILE COMMUNICATIONS NETWORK INC.) 15 July 1998

2. The document D1 is regarded as being the closest prior art to the subject-matter of claim 1, and shows (the references in parentheses applying to this document):

   A method for controlling transmission power (transmission power controller 20) of a signal which is received using a certain number of rake fingers (RAKE combiner 5), where
   a signal property estimate for a certain property (FER) of the received signal is determined;
   a value for a controlled variable (SIR) is determined using said signal property estimate; and
   the controlled variable is compared to a target value (Figure 3: SIR COMPARATOR 7 and TARGET SIR DECISION UNIT 12).

   Document D1 does not disclose the steps of
   - determining a discrepancy between said signal property estimate and actual property of the received signal, said discrepancy being related to the number of rake fingers used in receiving the signal and
   - taking into account said discrepancy when comparing the controlled variable value to the target value.

   Hence, the subject-matter of claim 1 is novel as required by Article 33(2) PCT.

The same applies to the corresponding independent apparatus claims 12 and 18, accordingly.

3. The subject-matter of the independent claims also involves an inventive step within the meaning of Article 33(3) PCT, the above-mentioned distinguishing features are not disclosed nor rendered obvious by the available prior art documents. The claimed method and apparatus have the advantage that the transmission power control method reacts only to actual changes in the signal power and not to changes which are due to allocation or release of rake fingers.

4. Claims 2 to 11, 13 to 17 and 19 to 21 are dependent on claims 1, 12 and 18, respectively, and as such also meet the requirements of the PCT with respect to novelty and inventive step.

Re Item VII

Certain defects in the international application

Contrary to the requirements of Rule 5.1(a)(ii) PCT, the relevant background art disclosed in the document D1 is not mentioned in the description, nor is this document identified therein.

A method according to the invention is a method for controlling transmission power of a signal which is received using a certain number of rake fingers, where
- a signal property estimate for a certain property of the received signal is determined,
- a value for a controlled variable is determined using at least said signal property estimate, and
- the controlled variable value is compared to a target value, and the method being further characterized in that
- a discrepancy between said signal property estimate and actual property of the received signal, said discrepancy being related to the number of rake fingers used in receiving the signal, is determined using at least the number of rake fingers and
- said discrepancy is taken into account when comparing the controlled variable value and the target value.

The invention relates also to a network element of a cellular network, which element comprises
- means for controlling the transmission power of a signal received using a rake receiver using a determined value for a controlled variable, the value of the controlled variable being arranged to be determined using at least a signal property estimate,
and which element is characterized in that it further comprises
- means for determining a discrepancy between the signal property estimate and actual property of the received signal using at least the number of rake fingers used in receiving the signal and
- means for taking said discrepancy into account when comparing the determined value for the controlled variable to a target value.

The means for taking the discrepancy into is for example one of the following: means for eliminating said discrepancy from the controlled variable value, means for modifying said target value to comprise said discrepancy.

A mobile station according to the invention, which mobile station comprises
- a rake receiver and
- means for controlling the transmission power of a received signal using a determined value for a controlled variable, the value of the controlled variable being arranged to be determined using at least a signal property estimate,
is characterized in that it further comprises

- means for determining a discrepancy between the signal property estimate and actual property of the received signal using at least the number of rake fingers used in receiving the signal and
- means for taking said discrepancy into account when comparing the determined value for the controlled value to a target value.

The means for taking the discrepancy into account may comprise one of the following: means for eliminating said discrepancy from the controlled variable value, means for modifying said target value to comprise the discrepancy.

In a method according to the invention a value for a controlled variable is determined usually based on the measured properties of the received signal. The

CLAIMS

1. A method (300, 400, 500) for controlling transmission power of a signal which is received using a certain number of rake fingers, where
- a signal property estimate for a certain property of the received signal is determined (302, 403),
- a value for a controlled variable is determined (405) using at least said signal property estimate, and
- the controlled variable value is compared (305) to a target value,
characterized in that
- a discrepancy between said signal property estimate and actual property of the received signal, said discrepancy being related to the number of rake fingers used in receiving the signal, is determined (304) using at least the number of rake fingers and
- said discrepancy is taken into account (305, 312) when comparing the controlled variable value to the target value.

2. A method according to claim 1, **characterized** in that
- a signal power estimate is determined (302, 403) using a certain part of the radio signal,
- an interference estimate is determined (302, 404), and
- the value for a controlled variable is determined (405) using said signal power estimate and said interference estimate.

3. A method according to claim 2, **characterized** in that
- a first discrepancy between said signal power estimate and the actual signal power is determined using at least the number of rake fingers and the interference estimate,
- a second discrepancy between said interference estimate and the actual interference is determined using at least said signal power estimate and
- both discrepancies are taken into account when comparing the controlled variable value to the target value.

4. A method according to claims 1 or 2, **characterized** in that the discrepancy depends on the value of the controlled variable.

5. A method according to claim 1, **characterized** in that said discrepancy is eliminated (406) from the controlled variable value.

6. A method according to claim 1, **characterized** in that said target value is modified (502) to comprise said discrepancy.

7. A method according to claim 1, **characterized** in that the signal to interference ratio is used (405) as the controlled variable.

8. A method according to claim 1, **characterized** in that the method is a closed loop power control method.

9. A method according to claim 1, **characterized** in that the initial target value is the same for all connections used to carry a certain service.

10. A method according to any of claims 1-9, where
- more than one receivers are receiving the signal and
- in each receiver a receiver-specific value for the controlled variable is determined, **characterized** in that
- the discrepancy is determined for each receiver and
- the receiver-specific discrepancies are taken into account (305, 312) in comparing the receiver-specific controlled variable value to the target value.

11. A method according to claim 10, **characterized** in that
- a same target value is sent to all the receivers and
- the receiver-specific discrepancies are taken into account in each receiver.

12. A network element (700) of a cellular network, which element comprises means for controlling the transmission power of a signal received using a rake receiver using a determined value of a controlled variable, the value of the controlled variable being arranged to be determined using at least a signal property estimate, **characterized** in that it further comprises
- means (304) for determining a discrepancy between the signal property estimate and actual property of the received signal using at least the number of rake fingers used in receiving the signal and
- means (305) for taking the discrepancy into account when comparing the controlled variable value to a target value.

13. A network element according to claim 12, **characterized** in that the means for taking the discrepancy into account comprise one of the following: means for eliminating said discrepancy from the controlled variable value, means for modifying said target value to comprise said discrepancy.

14. A network element according to claim 12, **characterized** in that the network element further comprises

- means (302) for determining a signal power estimate of a certain part of the received signal and
- means (302) for determining an interference estimate.

15. A network element according to claim 12, **characterized** in that it is a base station.

16. A network element according to claim 15, **characterized** in that it is a base station of a WCDMA network.

17. A network element according to claim 12, **characterized** in that it is a radio network controller of a WCDMA network.

18. A mobile station (710), which comprises
- a rake receiver (301) and
- means for controlling the transmission power of a received signal using a determined value for a controlled variable, the value of the controlled variable being arranged to be determined using at least a signal property estimate,

characterized in that it further comprises
- means for determining a discrepancy between the signal property estimate and actual property of the received signal using at least the number of rake fingers used in receiving the signal and
- means for taking said discrepancy into account when comparing the controlled variable value to a target value.

19. A mobile station according to claim 18, **characterized** in that the means for taking the discrepancy into account comprise one of the following: means for eliminating said discrepancy from the controlled variable value, means for modifying said target value to comprise said discrepancy.

20. A mobile station according to claim 18, **characterized** in that the it further comprises
- means (302) for determining a signal power estimate of a certain part of the received signal and
- means (302) for determining an interference estimate.

21. A mobile station according to claim 18, **characterized** in that it is a mobile station of a WCDMA network.

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PCT REQUEST 50192

Original (for **SUBMISSION**) - printed on 21.06.2000 03:23:48 PM

0 **0-1**	**For receiving Office use only** International Application No.	
0-2	International Filing Date	
0-3	Name of receiving Office and "PCT International Application"	
0-4 0-4-1	**Form - PCT/RO/101 PCT Request** Prepared using	PCT-EASY Version 2.90 (updated 10.05.2000)
0-5	**Petition** The undersigned requests that the present international application be processed according to the Patent Cooperation Treaty	
0-6	**Receiving Office (specified by the applicant)**	National Board of Patents and Registration (Finland) (RO/FI)
0-7	**Applicant's or agent's file reference**	50192
I	**Title of invention**	METHOD FOR CONTROLLING THE TRANSMISSION POWER
II II-1 II-2 II-4 II-5 II-6 II-7 II-8 II-9	**Applicant** This person is: Applicant for Name Address: State of nationality State of residence Telephone No. Facsimile No.	applicant only all designated States except US NOKIA NETWORKS OY P.O. Box 300 FIN-00045 Nokia Group Finland FI FI +358-9-51121 +358-9-51168080
III-1 III-1-1 III-1-2 III-1-4 III-1-5 III-1-6 III-1-7	**Applicant and/or inventor** This person is: Applicant for Name (LAST, First) Address: State of nationality State of residence	applicant and inventor US only HOLMA, Harri Itätuulenkuja 1 B 32 FIN-02100 Espoo Finland FI FI

By Express Mail
No. EL660968420US

PCT REQUEST 50192

Original (for **SUBMISSION**) - printed on 21.06.2000 03:23:48 PM

III-2	**Applicant and/or inventor**	
III-2-1	This person is:	applicant and inventor
III-2-2	Applicant for	US only
III-2-4	Name (LAST, First)	SALONAHO, Oscar
III-2-5	Address:	Oksasenkatu 4bA 8 FIN-00100 Helsinki Finland
III-2-6	State of nationality	FI
III-2-7	State of residence	FI
IV-1	**Agent or common representative; or address for correspondence** The person identified below is hereby/has been appointed to act on behalf of the applicant(s) before the competent International Authorities as:	agent
IV-1-1	Name	BERGGREN OY AB
IV-1-2	Address:	P.O. Box 16 FIN-00101 Helsinki Finland
IV-1-3	Telephone No.	+358-9-693701
IV-1-4	Facsimile No.	+358-9-6933944
IV-1-5	e-mail	email.box@berggren.fi
V	**Designation of States**	
V-1	Regional Patent (other kinds of protection or treatment, if any, are specified between parentheses after the designation(s) concerned)	AP: GH GM KE LS MW MZ SD SL SZ TZ UG ZW and any other State which is a Contracting State of the Harare Protocol and of the PCT EA: AM AZ BY KG KZ MD RU TJ TM and any other State which is a Contracting State of the Eurasian Patent Convention and of the PCT EP: AT BE CH&LI CY DE DK ES FI FR GB GR IE IT LU MC NL PT SE and any other State which is a Contracting State of the European Patent Convention and of the PCT OA: BF BJ CF CG CI CM GA GN GW ML MR NE SN TD TG and any other State which is a member State of OAPI and a Contracting State of the PCT
V-2	National Patent (other kinds of protection or treatment, if any, are specified between parentheses after the designation(s) concerned)	AE AG AL AM AT AU AZ BA BB BG BR BY BZ CA CH&LI CN CR CU CZ DE DK DM DZ EE ES FI GB GD GE GH GM HR HU ID IL IN IS JP KE KG KP KR KZ LC LK LR LS LT LU LV MA MD MG MK MN MW MX MZ NO NZ PL PT RO RU SD SE SG SI SK SL TJ TM TR TT TZ UA UG US UZ VN YU ZA ZW

PCT REQUEST 50192

Original (for **SUBMISSION**) - printed on 21.06.2000 03:23:48 PM

V-5	**Precautionary Designation Statement** In addition to the designations made under items V-1, V-2 and V-3, the applicant also makes under Rule 4.9(b) all designations which would be permitted under the PCT except any designation(s) of the State(s) indicated under item V-6 below. The applicant declares that those additional designations are subject to confirmation and that any designation which is not confirmed before the expiration of 15 months from the priority date is to be regarded as withdrawn by the applicant at the expiration of that time limit.		
V-6	**Exclusion(s) from precautionary designations**	NONE	
VI-1	**Priority claim of earlier national application**		
VI-1-1	Filing date	24 June 1999 (24.06.1999)	
VI-1-2	Number	991448	
VI-1-3	Country	FI	
VI-2	**Priority document request** The receiving Office is requested to prepare and transmit to the International Bureau a certified copy of the earlier application(s) identified above as item(s):	VI-1	
VII-1	**International Searching Authority Chosen**	European Patent Office (EPO) (ISA/EP)	
VIII	**Check list**	number of sheets	electronic file(s) attached
VIII-1	Request	4	-
VIII-2	Description	17	-
VIII-3	Claims	3	-
VIII-4	Abstract	1	50192.txt
VIII-5	Drawings	4	-
VIII-7	TOTAL	29	
	Accompanying items	paper document(s) attached	electronic file(s) attached
VIII-8	Fee calculation sheet	✓	-
VIII-10	Copy of general power of attorney	✓	-
VIII-16	PCT-EASY diskette	-	diskette
VIII-18	**Figure of the drawings which should accompany the abstract**	3	
VIII-19	**Language of filing of the international application**	English	
IX-1	**Signature of applicant or agent**	Sirpa Kuisma	
IX-1-1	Name	BERGGREN OY AB	
IX-1-2	Name of signatory	Sirpa Kuisma	
IX-1-3	Capacity	Patent Attorney	

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PCT REQUEST 50192

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FOR RECEIVING OFFICE USE ONLY

10-1	**Date of actual receipt of the purported international application**	
10-2	**Drawings:**	
10-2-1	Received	
10-2-2	Not received	
10-3	**Corrected date of actual receipt due to later but timely received papers or drawings completing the purported international application**	
10-4	**Date of timely receipt of the required corrections under PCT Article 11(2)**	
10-5	**International Searching Authority**	**ISA/EP**
10-6	**Transmittal of search copy delayed until search fee is paid**	

FOR INTERNATIONAL BUREAU USE ONLY

11-1	**Date of receipt of the record copy by the International Bureau**	

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PCT (ANNEX - FEE CALCULATION SHEET)

50192

Original (for **SUBMISSION**) - printed on 21.06.2000 03:23:48 PM

(This sheet is not part of and does not count as a sheet of the international application)

0 0-1	**For receiving Office use only** International Application No.	
0-2	Date stamp of the receiving Office	

0-4	**Form - PCT/RO/101 (Annex)** **PCT Fee Calculation Sheet**				
0-4-1	Prepared using		PCT-EASY Version 2.90 (updated 10.05.2000)		
0-9	**Applicant's or agent's file reference**		50192		
2	**Applicant**		NOKIA NETWORKS OY, et al.		
12	**Calculation of prescribed fees**		fee amount/multiplier	total amounts (FIM)	
12-1	Transmittal fee	T	⇨	800	
12-2	Search fee	S	⇨	5 618,71	
12-3	International fee Basic fee (first 30 sheets)	b1	2 431,8		
12-4	Remaining sheets		0		
12-5	Additional amount	(X)	53,51		
12-6	Total additional amount	b2	0		
12-7	b1 + b2 =	B	2 431,8		
12-8	Designation fees Number of designations contained in international application		87		
12-9	Number of designation fees payable (maximum 8)		8		
12-10	Amount of designation fee	(X)	523,22		
12-11	Total designation fees	D	4 185,76		
12-12	PCT-EASY fee reduction	R	-749,16		
12-13	Total International fee (B+D-R)	I	⇨	5 868,4	
12-14	Fee for priority document Number of priority documents requested		1		
12-15	Fee per document	(X)	422		
12-16	Total priority document fee	P	⇨	422	
12-17	**TOTAL FEES PAYABLE (T+S+I+P)**		⇨	12 709,11	
12-19	**Mode of payment**		cheque		

VALIDATION LOG AND REMARKS

13-2-6	**Validation messages** **Contents**	Green? Reference number for attached copy of general power of attorney not indicated.

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PCT (ANNEX - FEE CALCULATION SHEET)

50192

Original (for **SUBMISSION**) - printed on 21.06.2000 03:23:48 PM

13-2-7	Validation messages Fees	Green? Please verify that modified fee amounts are correct.

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50192

PCT

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PCT-EASY INFORMATION SHEET

(For applicant use only, DO NOT submit this sheet with the international application)

VALIDATION LOG

	Contents
Green?	Reference number for attached copy of general power of attorney not indicated.
	Fees
Green?	Please verify that modified fee amounts are correct.

Before submitting the International Application, please carefully verify that:

-the information contained on printed Request form is correct;
-Box IX of the Request form has been signed;
-all elements of the international application as indicated in Box VIII of the Request form have been attached; and,
-the diskette containing the PCT-EASY zip file of the International Application has been enclosed and has been clearly labeled "PCT-EASY", with the applicant's or agent's file reference, and the first applicant's name.

ATTENTION

DO NOT modify any indications on the Request form printout. The attached PCT-EASY application has been locked. If an error or an omission is discovered at this time, you must copy the submitted application as a template and make the change or correction in a new application (using the submitted application as a template). You may create such a template by copying the submitted application from the "Stored Forms" folder to the "New PCT Forms" folder. Open the new (.0WO) file created in the "New PCT Forms" folder, correct the errors and proceed with the submission process again.

By Express Mail
No. EL660968420US

The demand must be filed directly with the competent International Preliminary Examining Authority or, if two or more Authorities are competent, with the one chosen by the applicant. The full name or two-letter code of that Authority may be indicated by the applicant on the line below:

IPEA/ EP

PCT

PCT Chapter II
MU DG 2

DEMAND

under Article 31 of the Patent Cooperation Treaty:
The undersigned requests that the international application specified below be the subject of international preliminary examination according to the Patent Cooperation Treaty and hereby elects all eligible States (except where otherwise indicated).

For International Preliminary Examining Authority use only

Identification of IPEA	Date of receipt of DEMAND

Box No. I IDENTIFICATION OF THE INTERNATIONAL APPLICATION

Applicant's or agent's file reference: 50192/SKU/PKK

International application No.	International filing date *(day/month/year)*	(Earliest) Priority date *(day/month/year)*
PCT/FI00/00561	22 June 2000 (22.6.00)	24 June 1999 (24.6.99)

Title of invention: METHOD FOR CONTROLLING THE TRANSMISSION POWER

Box No. II APPLICANT(S)

Name and address: *(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)*

NOKIA NETWORKS OY
P.O.Box 300, FIN-00045 NOKIA GROUP, Finland

Telephone No.:

Facsimile No.:

Teleprinter No.:

State *(that is, country)* of nationality: Finland

State *(that is, country)* of residence: Finland

Name and address: *(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)*

HOLMA, Harri
Itätuulenkuja 1 B 32, FIN-02100 ESPOO, Finland

State *(that is, country)* of nationality: Finland

State *(that is, country)* of residence: Finland

Name and address: *(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)*

SALONAHO, Oscar
Oksasenkatu 4bA 8, FIN-00100 HELSINKI, Finland

State *(that is, country)* of nationality: Finland

State *(that is, country)* of residence: Finland

☐ Further applicants are indicated on a continuation sheet.

By Express Mail
No. EL660968420US

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PCT Chapt[illegible] MU DG 2

Sheet No. 2

International application No. PCT/FI00/00561

Box No. III AGENT OR COMMON REPRESENTATIVE; OR ADDRESS FOR CORRESPONDENCE

The following person is [X] agent [ ] common representative

and [X] has been appointed earlier and represents the applicant(s) also for international preliminary examination.

[ ] is hereby appointed and any earlier appointment of (an) agent(s)/common representative is hereby revoked.

[ ] is hereby appointed, specifically for the procedure before the International Preliminary Examining Authority, in addition to the agent(s)/common representative appointed earlier.

Name and address: *(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)*

BERGGREN OY AB
P.O. Box 16, FIN-00101 HELSINKI, Finland

Telephone No.: +358 9 693 701

Facsimile No.: +358 9 693 3944

Teleprinter No.:

[ ] **Address for correspondence:** Mark this check-box where no agent or common representative is/has been appointed and the space above is used instead to indicate a special addr ess to which correspondence should be sent.

Box No. IV BASIS FOR INTERNATIONAL PRELIMINARY EXAMINATION

Statement concerning amendments:*

1. The applicant wishes the international preliminary examination **to start on the basis of:**

[X] the international application as originally filed

the description [X] as originally filed
[ ] as amended under Article 34

the claims [X] as originally filed
[ ] as amended under Article 19 (together with any accompanying statement)
[ ] as amended under Article 34

the drawings [X] as originally filed
[ ] as amended under Article 34

2. [ ] The applicant wishes any amendment to the claims under Article 19 to be considered as reversed.

3. [ ] The applicant wishes the start of the international preliminary examination **to be postponed** until the expiration of 20 months from the priority date unless the International Preliminary Examining Authority receives a copy of any amendments made under Article 19 or a notice from the applicant that he does not wish to make such amendments (Rule 69.1(d)). *(This check-box may be marked only where the time limit under Article 19 has not yet expired.)*

* Where no check-box is marked, international preliminary examination will start on the basis of the international application as originally filed or, where a copy of amendments to the claims under Article 19 and/or amendments of the international application under Article 34 are received by the International Preliminary Examining Authority before it has begun to draw up a written opinion or the international preliminary examination report, as so amended.

Language for the purposes of international preliminary examination: English

[X] which is the language in which the international application was filed.

[X] which is the language of a translation furnished for the purposes of international search.

[X] which is the language of publication of the international application.

[ ] which is the language of the translation (to be) furnished for the purposes of international preliminary examination.

Box No. V ELECTION OF STATES

The applicant hereby elects **all eligible States** *(that is, all States which have been designated and which are bound by Chapter II of the PCT)*

excluding the following States which the applicant wishes **not to elect:**

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PCT Chapter II
MU DG 2

Sheet No. 3

International application No.
PCT/FI00/00561

Box No. VI CHECK LIST

The demand is accompanied by the following elements, in the language referred to in Box No. IV, for the purposes of international preliminary examination:			For International Preliminary Examining Authority use only: received	not received
1. translation of international application	:	sheets	☐	☐
2. amendments under Article 34	:	sheets	☐	☐
3. copy (or, where required, translation) of amendments under Article 19	:	sheets	☐	☐
4. copy (or, where required, translation) of statement under Article 19	:	sheets	☐	☐
5. letter	:	sheets	☐	☐
6. other *(specify)*	:	sheets	☐	☐

The demand is also accompanied by the item(s) marked below:

1. [X] fee calculation sheet
2. [ ] separate signed power of attorney
3. [ ] copy of general power of attorney; reference number, if any:
4. [ ] statement explaining lack of signature
5. [ ] nucleotide and or amino acid sequence listing in computer readable form
6. [ ] other *(specify)*:

Box No. VII SIGNATURE OF APPLICANT, AGENT OR COMMON REPRESENTATIVE

Next to each signature, indicate the name of the person signing and the capacity in which the person signs (if such capacity is not obvious from reading the demand).

BERGGREN OY AB

Sirpa Kuisma
Patent Agent

HELSINKI, Finland 18 January 2001

For International Preliminary Examining Authority use only

1. Date of actual receipt of DEMAND:
2. Adjusted date of receipt of demand due to CORRECTIONS under Rule 60.1(b):
3. [ ] The date of receipt of the demand is AFTER the expiration of 19 months from the priority date and item 4 or 5, below, does not apply. [ ] The applicant has been informed accordingly.
4. [ ] The date of receipt of the demand is WITHIN the period of 19 months from the priority date as extended by virtue of Rule 80.5.
5. [ ] Although the date of receipt of the demand is after the expiration of 19 months from the priority date, the delay in arrival is EXCUSED pursuant to Rule 82.

For International Bureau use only

Demand received from IPEA on:

PCT Chapter II
MU DG 2

PCT

FEE CALCULATION SHEET

Annex to the Demand for international preliminary examination

International application No. PCT/FI00/00561	For International Preliminary Examining Authority use only
Applicant's or agent's file reference 50192/SKU/PKK	Date stamp of the IPEA
Applicant: NOKIA NETWORKS OY	

Calculation of prescribed fees

1. Preliminary examination fee	EUR 1533	P
2. Handling fee *(Applicants from certain States are entitled to a reduction of 75% of the handling fee. Where the applicant is (or all applicants are) so entitled, the amount to be entered at H is 25% of the handling fee.)*	EUR 147	H
3. Total of prescribed fees Add the amounts entered at P and H and enter total in the TOTAL box	EUR 1680	TOTAL

Mode of Payment

- ☐ authorization to charge deposit account with the IPEA (see below)
- ☐ cheque
- ☐ postal money order
- ☐ bank draft
- ☐ cash
- ☐ revenue stamps
- ☐ coupons
- ☒ other *(specify)*: Bank transfer to account 157230-340380

Deposit Account Authorization *(this mode of payment may not be available at all IPEAs)*

The IPEA/ _____ ☐ is hereby authorized to charge the total fees indicated above to my deposit account.

☐ *(this check-box may be marked only if the conditions for deposit accounts of the IPEA so permit)* is hereby authorized to charge any deficiency or credit any overpayment in the total fees indicated above to my deposit account.

Deposit Account Number _____ Date *(day/month/year)* _____ Signature _____

See Notes to the fee calculation sheet

By Express Mail
No. EL660968420US

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PATENT COOPERATION TREATY

From the INTERNATIONAL BUREAU

PCT

NOTICE INFORMING THE APPLICANT OF THE COMMUNICATION OF THE INTERNATIONAL APPLICATION TO THE DESIGNATED OFFICES

(PCT Rule 47.1(c), first sentence)

To:
BERGGREN OY AB
P.O. Box 16
FIN-00101 Helsinki
FINLANDE

Date of mailing (day/month/year) 04 January 2001 (04.01.01)	
Applicant's or agent's file reference 50192	**IMPORTANT NOTICE**

International application No.	**International filing date** (day/month/year)	**Priority date** (day/month/year)
PCT/FI00/00561	22 June 2000 (22.06.00)	24 June 1999 (24.06.99)

Applicant
NOKIA NETWORKS OY et al

1. Notice is hereby given that the International Bureau has communicated, as provided in Article 20, the international application to the following designated Offices on the date indicated above as the date of mailing of this Notice:
   AG,AU,BZ,DZ,KP,KR,MZ,US

   In accordance with Rule 47.1(c), third sentence, those Offices will accept the present Notice as conclusive evidence that the communication of the international application has duly taken place on the date of mailing indicated above and no copy of the international application is required to be furnished by the applicant to the designated Office(s).

2. The following designated Offices have waived the requirement for such a communication at this time:
   AE,AL,AM,AP,AT,AZ,BA,BB,BG,BR,BY,CA,CH,CN,CR,CU,CZ,DE,DK,DM,EA,EE,EP,ES,FI,GB,GD,GE,GH,GM,HR,HU,ID,IL,IN,IS,JP,KE,KG,KZ,LC,LK,LR,LS,LT,LU,LV,MA,MD,MG,MK,MN,MW,MX,NO,NZ,OA,PL,PT,RO,RU,SD,SE,SG,SI,SK,SL,TJ,TM,TR,TT,TZ,UA,UG,UZ,VN,YU,ZA,ZW
   The communication will be made to those Offices only upon their request. Furthermore, those Offices do not require the applicant to furnish a copy of the international application (Rule 49.1(a-bis)).

3. Enclosed with this Notice is a copy of the international application as published by the International Bureau on
   04 January 2001 (04.01.01) under No. WO 01/01601

REMINDER REGARDING CHAPTER II (Article 31(2)(a) and Rule 54.2)

If the applicant wishes to postpone entry into the national phase until 30 months (or later in some Offices) from the priority date, **a demand for international preliminary examination** must be filed with the competent International Preliminary Examining Authority before the expiration of 19 months from the priority date.

It is the applicant's sole responsibility to monitor the 19-month time limit.

Note that only an applicant who is a national or resident of a PCT Contracting State which is bound by Chapter II has the right to file a demand for international preliminary examination.

REMINDER REGARDING ENTRY INTO THE NATIONAL PHASE (Article 22 or 39(1))

If the applicant wishes to proceed with the international application in the **national phase**, he must, within 20 months or 30 months, or later in some Offices, perform the acts referred to therein before each designated or elected Office.

For further important information on the time limits and acts to be performed for entering the national phase, see the Annex to Form PCT/IB/301 (Notification of Receipt of Record Copy) and Volume II of the PCT Applicant's Guide.

The International Bureau of WIPO
34, chemin des Colombettes
1211 Geneva 20, Switzerland

Facsimile No. (41-22) 740.14.35

Authorized officer
J. Zahra

Telephone No. (41-22) 338.83.38

3744240

By Express Mail
No. EL660968420US

Continuation of Form PCT/IB/3

NOTICE INFORMING THE APPLICANT OF THE COMMUNICATION OF THE INTERNATIONAL APPLICATION TO THE DESIGNATED OFFICES

Date of mailing (day/month/year)	IMPORTANT NOTICE
04 January 2001 (04.01.01)	
Applicant's or agent's file reference	**International application No.**
50192	PCT/FI00/00561

The applicant is hereby notified that, at the time of establishment of this Notice, the time limit under Rule 46.1 for making amendments under Article 19 has not yet expired and the International Bureau had received neither such amendments nor a declaration that the applicant does not wish to make amendments.

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PATENT COOPERATION TREATY

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference	**FOR FURTHER ACTION** see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, item 5 below.	
50192		
International application No.	International filing date *(day/month/year)*	(Earliest) Priority Date *(day/month/year)*
PCT/FI 00/00561	22/06/2000	24/06/1999
Applicant		
NOKIA NETWORKS OY		

This International Search Report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This International Search Report consists of a total of 3 sheets.

[X] It is also accompanied by a copy of each prior art document cited in this report.

1. **Basis of the report**

   a. With regard to the **language,** the international search was carried out on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.

   [ ] the international search was carried out on the basis of a translation of the international application furnished to this Authority (Rule 23.1(b)).

   b. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international search was carried out on the basis of the sequence listing :

   [ ] contained in the international application in written form.

   [ ] filed together with the international application in computer readable form.

   [ ] furnished subsequently to this Authority in written form.

   [ ] furnished subsequently to this Authority in computer readble form.

   [ ] the statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.

   [ ] the statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished

2. [ ] **Certain claims were found unsearchable** (See Box I).

3. [ ] **Unity of invention is lacking** (see Box II).

4. With regard to the **title,**

   [X] the text is approved as submitted by the applicant.

   [ ] the text has been established by this Authority to read as follows:

5. With regard to the **abstract,**

   [X] the text is approved as submitted by the applicant.

   [ ] the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. The figure of the **drawings** to be published with the abstract is Figure No. 3

   [X] as suggested by the applicant.

   [ ] because the applicant failed to suggest a figure.

   [ ] because this figure better characterizes the invention.

   [ ] None of the figures.

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/FI 00/00561

A. CLASSIFICATION OF SUBJECT MATTER

IPC7: H04B 7/005
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: H04B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 0853393 A1 (NTT MOBILE COMMUNICATIONS NETWORK INC.), 15 July 1998 (15.07.98), column 6, line 29 - column 8, line 55 --	1-21
A	1997 IEEE, Ashwin Sampath et al: "On Setting Reverse Link Target SIR in a CDMA System", pages 929-933, see the whole document --	1-21
A	WO 9858461 A1 (TELEFONAKTIEBOLAGET LM ERICSSON), 23 December 1998 (23.12.98), page 10, line 24 - page 13, line 25, figure 5 --	1-21

[X] Further documents are listed in the continuation of Box C. [X] See patent family annex.

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Date of the actual completion of the international search	Date of mailing of the international search report
4 October 2000	24. 11. 2000
Name and mailing address of the International Searching Authority European Patent Office P.B. 5818 Patentlaan 2 NL-2280 HV Rijswijk Tel(+31-70)340-2040, Tx 31 651 epo nl, Fax(+31-70)340-3016	Authorized officer FREDRIK BLOMQVIST/AE Telephone No.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/FI 00/00561

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	IEICE TRANS. COMMUN, Volume E81-B, No 7, July 1998, Shunsuke SEO et al., "SIR-Based Transmit Power Control of Reverse Link for Coherent DS-CDMA Mobile Radio", page 1508 - page 1516, section 2,3, 4	1-21

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SA 289756

INTERNATIONAL SEARCH REPORT

Information on patent family members

01/08/00

International application No.
PCT/FI 00/00561

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 0853393 A1	15/07/98	CA 2230778 A	31/12/97
		CN 1198274 A	04/11/98
		WO 9750197 A	31/12/97
WO 9858461 A1	23/12/98	AU 8050198 A	04/01/99
		EP 0990314 A	05/04/00

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